Upham Woods Grab and Go: D.O.T.S. Tool - GPS

Concept: Create a baseline knowledge of the uses and applications of GPS and become familiar with the concept of geocaching.

Age level: 4th grade- 12th grade

Education Standards:
HS-LS1-5 HS-LS2-5 HS-ESS2-2 HS-ESS2-6 HS-ESS2-4 HS-ESS3-5 HS-ESS3-5 HS-PS4-2

Success Indicator:
Youth will successfully be able to define what a GPS is and how to use it to find geocaches. Students will be able to navigate to waypoints using only their GPS to practice real-world geocaching.

Background Information:
Technology has been integrated into virtually every facet of education. Through Digital Observation Technology Skills (DOTS) youth are able to experience and identify various aspects of nature through technology. One of the tools used to make these connections with nature is a handheld GPS unit. GPS stands for Global Positioning System. GPS units find your location by triangulating from a minimum of three satellites that are orbiting the earth from space. The importance of GPS along with its usage in science is infinite.

Geocaching is the recreational act of using GPS to locate waypoints, or "caches," that other people have left behind. These waypoints can be downloaded onto your personal GPS unit and then used in order to find the hidden caches. GPS units are extremely accurate thanks to modern technology, but there are a few instances where GPS units may portray incorrect information. These circumstances occur when you are attempting to locate a geocache while too close to a building or rock formation. GPS units also cannot work underwater or underground. Remember that your unit must be able to "see" three orbiting satellites to give accurate locations.

Preparation

Time: 30 minutes- 1 hour

Space: Large outdoor area. For a younger audience, you will need less space and vice versa for an older audience.

Materials:
-GPS units (1 unit/2 students)
-Trinket to put at each waypoint location
-Extra batteries

Introductory Questions:
1. What do you know about GPS?
2. Have you ever heard of the word "geocaching?" What do you think it means?
3. How do you use GPS units in your daily lives?
4. How do you think scientists use GPS?
5. What could lead to GPS unit inaccuracies?

Prior to the Program:

1. Choose the area in which the program will take place. Be sure that the area is very spacious. Depending on how long you want the program to take place, multiple caches with multiple waypoints will be required.

2. Check the battery life of each GPS unit. If any units have less than half of their battery life, replace the batteries in the unit. Be sure to have extra batteries on hand when you're in the field.

3. Once you have chosen the area, gather all GPS units and travel to the place where you want to mark waypoint #1. On all GPS units, mark that waypoint while standing in the same spot (directions on the back of this page.)

4. After marking the waypoint with all GPS units, be sure to leave a trinket of some sort so that the student can prove that they did indeed find the waypoint. Don't make the trinket too obvious! Compare geocaching to a scavenger hunt and encourage the students to look up, down and around to locate the trinket. Be sure that you leave one trinket per group of students at each cache so that each group may take one.

5. Once you have marked waypoint #1, continue to travel to different spots, repeating the process.
** Ten waypoints are recommended for a thirty minute program. Each waypoint should be a minimum of 30 yards away from other waypoints in any direction. **

6. Once you have finished marking the waypoints, be sure to check and make sure that each GPS unit has the same number of waypoints at the same geographic locations.

How to Mark a Waypoint

1. Turn your Garmin DAKOTA 10 GPS unit on.
2. Once on, scroll one page to the right by clicking on the right arrow at the bottom of the screen.
3. Click "Mark Waypoint."
4. Click "Save"
5. The waypoint that you just marked should give you a numerical name. Repeat steps 2-5 to mark other waypoints.

* You can check previously marked waypoints by clicking "Waypoint Manager."

How to Delete Waypoints

1. Navigate to "Waypoint Manager."
2. Select the waypoint that you wish to delete.
3. Once on that screen, click the down arrow two times until you find "Delete Waypoint."
4. Click Delete Waypoint and continue process for all waypoints you wish to delete.

Did you Know…?

- There are always at least 24 GPS satellites circling the earth.
- These satellites go around the earth twice every day moving at roughly 7,000 mph!
- GPS is now in some brands of shoes, mainly to find someone who has Alzheimer's disease in case they get lost.
- When a GPS locates where you are in the world, it gives you the longitude and latitude of your exact location.

Teaching the Program:

1. Gather students either in a classroom or outside. Have students choose a partner and brainstorm the answers to the *Introductory Questions* (pg. 1). Go over the answers. **Answers can be found in the *Background* section of pg. 1.)**

2. Pass out a GPS unit to each pair of students. Help them navigate to the "waypoints" page and have them practice clicking on Waypoint #1 and walking around following a compass in order to find that waypoint. Be sure to bring to their attention that the GPS tells you how far away you are from the waypoint and that it can be extremely helpful!
Remember that a GPS unit can only accurately bring you to within 20 ft. of the waypoint. When the students reach that 20 ft., remind them to begin looking for the cache.

Safety tip: If working in a large area, remind students of their boundaries. I.E. if you pass that tree you've gone too far, turn around if you reach the road, etc.

3. After students are in their groups of two, instruct each of them to start at a different cache and work their way throughout the ten caches but skipping the practice cache. (One group may go through caches 1-10, another group should start at cache 3 and navigate to all caches until they reach cache 2, etc.)

4. Remind students to make sure they grab ONE trinket to ensure the teacher that they found the cache.

5. If there are students who zoom through the course, have them go help a team who may be a little further behind.

6. If everyone has finished the course and there is still time, redistribute the trinkets. Have each group go mark a waypoint and then trade GPS units with another group. See if everyone can find Waypoint #11!

Wrapping Up:

1. Bring students back together in a group and have the groups tell you their stories about finding the caches. Encourage discussion by asking which cache was the most difficult to find and how they came to find it.

2. Ask if any of the students have smartphones or handheld GPS units and tell them about **geocaching.com** where they can hunt for caches all over the city they live. The caches were left by fellow geocaching enthusiasts who register the cache on this site. Sometimes in the trinkets that people leave there will be a log book where you simply sign your name, or you might even find money!

3. Make sure all of the trinkets from the waypoints were collected. Assign groups to go to each cache and collect the rest of the trinkets if there are any.

4. Before collecting GPS units, have each team delete the waypoints from that day if you're not teaching the program again.
If you are teaching the same program in the near future, leave the waypoints on the GPS and write down where they are so that you don't forget. This way you can have cliffs notes as to where to hide the trinkets for next time!

5. Collect GPS units and trinkets.